

# CLAIMS

1. A liquid polyethercarbonatediol compound comprising a reaction product of

(1) a carbonate ester compound,

with

(2) a polyetherdiol compound comprising (A) at least one type of structural units represented by the formula (a):



in which formula (a), R represents a member selected from unsubstituted linear alkylene groups having 3 to 5 carbon atoms and substituted alkylene groups each constituted from a linear alkylene backbone chain having 3 to 5 carbon atoms and at least one alkyl side chain attached to the backbone chain and having 1 to 4 carbon atoms, and (B) at least one type of structural units selected from those represented by the formulae (b) and (c):



and



wherein an average molar number  $n$  of the structural units of the formula (b) and an average molar number of  $m$  of the structural units of the formula (c) each per mole of the structural units of the formula (a) contained in the polyetherdiol compound (2) are, respectively and independently from each other a positive number satisfying the requirements:

$$0 \leq n \leq 5$$

and

$$0 \leq m \leq 5,$$

and the sum (n + m) of the average molar numbers n and m of the structural units of the formulae (b) and (c) is a positive number satisfying the requirement:

$$1 < (n + m) \leq 5$$

2. The liquid polyethercarbonatediol compound as claimed in claim 1 wherein, in the polyetherdiol compound (2), the average molar number m of the structural units of the formula (c) per mole of the structural units of the formula (a) is zero.

3. The liquid polyethercarbonatediol compound as claimed in claim 1 or 2, wherein the polyetherdiol compound (2) is selected from addition reaction products of (i) at least one member selected from unsubstituted and substituted 1,3-propanediol, unsubstituted and substituted 1,4-butanediols, and unsubstituted and substituted 1,5-pentanediols, each of which substituted compounds has at least one alkyl group having 1 to 4 carbon atoms and attached to the alkylene group of the substituted compound, with (ii) at least one member selected from ethyleneoxide and propyleneoxide.

4. The liquid polyethercarbonatediol compound as claimed in claim 1 or 2, wherein the polyetherdiol compound (2) has a number average molecular weight of 100 to 500.

5. The liquid polyestercarbonatediol compound as claimed in claim 1 or 2, having a number average molecular weight in the range of from 400 to 5000.

6. The liquid polyethercarbonatediol compound as claimed in claim 1 or 2, wherein the carbonate ester compound (1) is selected from dialkyl carbonates, diary carbonates, alkylene carbonates and alkylaryl carbonates.

7. A thermoplastic polyurethane comprising an addition reaction product of a diol component comprising at least one liquid polyethercarbonatediol compound as claimed in any one of claims 1 to 6, with a polyisocyanate compound component comprising at least one polyisocyanate compound and with a chain extender.

8. The thermoplastic polyurethane as claimed in claim 7, wherein the polyisocyanate compound is selected from 1,3-trimethylenediisocyanate, 1,4-tetramethylenediisocyanate, 1,6-hexamethylenediisocyanate, 2,2,4-trimethylhexamethylenediisocyanate, 2,4,4-trimethylhexamethylenediisocyanate, 1,9-nonamethylenediisocyanate, 1,10-decamethylenediisocyanate, 1,4-cyclohexanediisocyanate, isophoronediiisocyanate, 4,4'-dicyclohexylmethanediisocyanate, 2,2'-diethyletherdiisocyanate, hydrogenated xylenediisocyanate, hexamethylenediisocyanate-biuret compound, p-phenylenediisocyanate, tolylenediisocyanate, xylylenediisocyanate, 4,4'-diphenyldiisocyanate, 1,5-naphthalenediisocyanate, 4,4'-diphenylmethanediisocyanate, 3,3'-methyleneditolylene-4,4'-diisocyanate, tolylenediisocyanate-trimethylol propane adduct, triphenylmethanetriisocyanate, 4,4'-diphenyletherdiisocyanate, tetrachlorophenylenediisocyanate, 3,3'-dichloro-4,4'-diphenylmethane-diisocyanate, and triisocyanatephenylthiophosphate.

9. The thermoplastic polyurethane as claimed in claim 7, wherein the chain extender comprises at least one member selected from ethyleneglycol, 1,2-propyleneglycol, 1,3-butanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,8-octanediol, 1,9-nonanediol, 1,10-decanediol, neopentyl glycol, 3-methyl-1,5-pentanediol, 3,3-dimethylolheptane, 1,4-cyclohexanediol, 1,4-cyclohexanedimethanol, 1,4-dihydroxyethylcyclohexane, ethylenediamine, 1,2-propylene-diamine, 1,6-hexamethylenediamine, isophoronediamine, bis(4-aminocyclohexyl) methane, piperazine, metha-or para-xylylenediamine, 2-ethanolamine, N-methyldiethanolamine, N-phenyldipropanolamine, hydroxyethylsulfamide, hydroxyethylaminoethylsulfamide, urea and water.